

MILLION Solar ROOFS

SUCCESS STORIES

The goal of the Million Solar Roofs Initiative is to install one million solar energy systems on U.S. buildings by 2010. The Initiative focuses on two types of solar energy technology — photovoltaics that produce electricity from sunlight, and solar thermal systems that produce heat for domestic hot water, space heating or heating swimming pools. The U.S. Department of Energy leads this effort in partnership with the building industry, other federal agencies, utilities, the solar energy industry, financial institutions, state and local governments, and non-governmental organizations. These partnerships concentrate on removing market barriers and developing and strengthening demand for solar energy products and applications. As progress is made toward the goal of one million solar roofs, greenhouse gases and other harmful emissions will be reduced, high tech jobs will be created, and the U.S. solar energy industry will retain its competitive edge.



Project: New London Ledge Lighthouse

Type: Off-Grid PV

Location: New London, Connecticut

Background: The Coast Guard Civil Engineering Unit Providence has undertaken a project to solarize all off-shore lighthouses in the Northeast First District. One such lighthouse is the New London Ledge lighthouse off the coast of New London, Connecticut. The unusual aspect of this project was the limited available space on the catwalk of the lighthouse to install a low-profiled solar array system to satisfy the historicity factor as required by the State Historic Preservation Office.

Previously, the lighthouse had been connected to the utility grid via a 6081 foot long submarine cable running underwater from a utility pole in Groton, Connecticut to the offshore lighthouse. The primary voltage was 2400 volts, stepped down to 240/120V via a transformer. The Coast Guard has found such submarine cables to be costly given the many man-hours of maintenance and repair they require. In addition, the Coast Guard faced higher-than-normal utility bills that are associated with the high-voltage electrical service to offshore structures.

Since the lighthouse is no longer manned, substantially less power is needed for its operation. Therefore, solar power is a more logical source of primary and emergency power to meet the decreased electrical load.

System Description: The ideal position for the PV system - due south - was located on a corner of the square lighthouse. Therefore, to keep the profile as low to the deck as possible, the electrical engineer/solar designer decided to wrap the support structures around two corners. There was also a concern about loss of valuable sun hours. Two arrays of six 43-watt panels were placed on the due south corner, and one array of five 43-watt panels was placed on the southeast and southwest corners.



The system had to be at least 800 watts in order to operate the primary system. In order to obtain 800 watts the engineer calculated they would need nineteen 43-watt high density panels if all the panels faced due south. Since the two arrays facing southwest and southeast would provide less power, twenty-two 43-watt panels were installed to operate the load. The overall potential output is approximately 847.1 watts with the solar array at a 60 degree tilt.

The emergency system consists of one 48-watt high-density solar panel wired directly to 10 NICAD 240 A-H (1.2 volt cells) batteries. The batteries are tied in series. During power loss or low voltage, the charge controller will switch over to auxiliary modes and the emergency batteries will operate a 300 mm optic as the emergency light (with flasher, 2.03 amp lamps, and 6-place lamp changer). Also operated from the emergency power is the fog detector and one FA-232 sound signal (½ mile horn).

Financing: The project was financed through the Coast Guard Headquarters budget.

Total Installed Cost: The total installed cost is approximately \$50,000. This includes the cost for new materials and transportation to the lighthouse to remove the emergency generator, diesel fuel tank, and existing automation equipment, and to install a new system. The total installed cost does not reflect the labor hours provided by the electricians for this project since the Coast Guard employed the electricians at no additional cost to the solarization budget.

Savings: The system will save approximately \$15,000 per year. This includes energy and personnel maintenance savings.

Climate: There are approximately 9-10 hours of daylight in the winter, and about 12-14 hours of daylight in the summer.

Environmental benefits: The existing AC system had emergency power via a diesel generator. Without this generator, there is no need for diesel fuel to be delivered offshore. Thus, it eliminates the possibility of fuel spills into the ocean and it eliminates the emissions that were once generated by the diesel exhaust.

There is no need for a transformer.

The only materials to concern environmental safety are the batteries. These are contained within the structure of the lighthouse with a pit surrounding the batteries in case of any electrolyte discharge.

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